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Research paper

Sales Volume and Sales Space Correlation in a Retail Store

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Abstract

In a retailer chain, the allocated sales space for an article or a range is a decision that needs deep reflection due to the commercial implication. Even though, in most of the cases this decision is made on an empirical base. In this paper, we will study this link by defining its nature, its limits and try to understand the potential impact of changing space on the sales and prove the importance of theoretical approach which remained so far on an experimental level

Keywords: *Category Management; Merchandising; Retail; Sales space; Sales Volume*

1. Introduction

In a highly competitive industry such as hypermarket stores, the sales techniques are very developed and the margins very squeezed, and finding a development leverage to grant a sustainable profitability is a must nowadays.

Companies in the market place are using two strategies: targeting by developing each category or each shelf in one hand, and a transversal approach where optimization and inter-category synergies of different company resources are sought in the other hand.

Thus, the retailer is managing the resources and means allocation to the different ranges and products sold in his store. So which methods to apply while allocating these resources? Among the most valuable resources in a retail store, the sale space is a key one. Which sales space to allocate to which category and which product are decisive issues for any retail store wether in the opening or during the regular remodeling of the store.

However, deciding on sales space requires a deep knowledge of the correlation between sales space and sales volume, a correlation until then little known.

Few are the academics works that were interested in exploring the correlation between sales space and sales volume in hypermarket stores, some have tried to analyze it on item level, others focused on its nature at category or department level, by studying the whole point of sale, we will be interested in all levels of analysis previously studied but also in estimation methods to model the space / sales volume correlation as well as different interaction effects.

In this paper we will try to study this correlation, define its nature and limits, and understand the potential impact of a variation in the sales space on the sales volume achieved, and demonstrate the importance of the theoretical contribution to this approach so far mainly experimental.

First we will start with an analysis of the state of art and we will present its theorical fundamentals..

2. The methodologies used to estimate the sales space and sales volume correlation

In this space/volume link, two main contribution shows up in the literature: experimental contribution and descriptive ones, these latter are more recent.

2.1. Experimental works

It was around the end of the 1960s and the beginning of 70s of the last century that the first research on this correlation started, they had mainly taken the form of in-store experiment, we will mention in order of publication those of Cox (1964, 1970)n Kotzan and Evanson (1969), Curhan (1972) who were strongly challenged by Peterson and Cagley, (1973) and Doyle and Gidengil (1977) mentioning a lack of internal and external validity respectively for low number of products and many biases experiments and sampling convenience of stores, Renaudin (2004). Several years later, in 1994, Drèze, Hoch and Purk have conducted one of the most complete and most im-

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portant researches by estimating the impact of the reallocation of sales space to products among a category, an ambitious study including 60 stores and 8 random categories.

At this stage we emphasize the particularity of experimental work to present this ability to establish a causal correlation between the sales volume and the sales space, let's note that hey can only be interpreted if the external variables are controlled by a random assignment of the experimental units or by the integration of controlled external variables in the experimental plan, however, in large retail stores, the external variables are many, if not too many, a very large stores sample, and a maximum precaution to ensure the internal validity of study are two sine qua none conditions of this type of work, which presents a considerable heaviness during the implementation, despite it's very attractive character to demonstrate causality.

We will remember that most of the works are interested in the space / volume correlation at an item level, this being due to the reluctance of retail store to allow this type of studies and the fact that is almost impossibility to allow it at the category level.

2.2. Descriptive works

The sales volume and sales space correlation has also been treated from a descriptive point of view, by the study of raw statistics data on sales space and sales volume.

The Variance then comes from snapshot observation of allocated space and sales in a store, Renaudin (2004). Works in snapshots presents the particularity to apply to different levels of aggregation of the offer, general store level (Thurik, 1988), categories of products (McGoldrick and Thorpe, 1977), references (Frank and Massy, 1970, Desmet, 1991), unlike work concentrated on the product of category.

Cross-sectional estimations were also realized in the allocation optimization models that resulted in an application on real data (works of Corstjens and Doyle, 1981, reapplied by Swinnnen, 1983, and Desmet, 1993, works of Campo and Al., 2000, Renaudin, 2004).

The cross-sectional estimation of this link by econometric techniques unlike the experimental method is simple and easy in its implementation given the immediate availability of data, usually centralized by the distributor. It's easier to estimate the correlation on a big number of product or categories. However this methods had it's limits, such as:

- Difficulty or impossibility to make sure that the given sales space is the cause and the sales volume is the result, usually the sales space is allocated based on the sales forecast, then the reverse coraltion is possible.
- If the retailer had decided to standardized his selves and being given the need to have a sufficient variance of space allocation from one store to another to come out with a valid estimation, we just interpret the result limiting it to the spaces observed in the shop
- The large number of external variables that impact sales

3. The correlation type between sales space and sales volume

It was in the early sixties that the first conceptual works on the correlation type between sales space and sales volume were realized by Brown and Tucker (1961), three types of different profiles appear:

- "**Non-reactive products**" like table salt, where the space's influence on sales is zero, from an almost immediate threshold space allocated
- The "**day to day consumers goods**" consumer food items is an example, where the number of "facing" strongly impacts sales initially, stagnation of sales are quickly reached as soon as an allocated space threshold is reached.
- "Products **with occasional purchase** "or unscheduled purchases, where sales are heavily impacted by the allocated space. For these products, sales grow only from a minimum threshold of space and the saturation threshold is reached only later on. Renaudin (2004).

Four decades later, in 2000, Fady and Seret (2000) suggest a different categorization other than those suggested by Crown and Tucker, they call "premeditated purchases" what the latter called "non-reactive products" and "commonly used products" and propose a graphical interpretation that is similar to a multiplicative function. For the "occasional purchases" last cited by Crown and Tucker they are called "impulsive" by Fady and Sert, and suggest an S-curve as being the most suitable for modeling the space / sales volume function
Different specifications functionalities of the correlation between sales space and sales volume have been proposed, including the normative models of space allocation, we can find four types of functions:

- **Linear functions** that shows a sustainable performance of the allocated space (Frank and Massy, 1970 and Desmet, 1991, Renaudin 2004)
- **Concave multiplicative functions** assuming a decreasing performance of space (Curhan, 1972, Hansen et Heinsbroek, 1979, Corstjens et Doyle, 1981, 1983, Swinnen, 1983, Zufryden, 1986, Borin et al., 1994, Desmet, 1993 et Urban, 1998, Renaudin 2004)
- **S curves** that involve increasing and decreasing performance of space (Anderson, 1979, Drèze et al., 1994). This functional form is the most empirically based (perception theory) (Renaudin, 2004)
- **Flexible logistics functions,** are either concave or S, depending on parameter value measuring the estimated effect of visibility on sales (attraction models, symmetric or not. Bultez et al.,1988, 1989, 1995 and Campo and al., 2000, Renaudin 2004)

All authors agree that there is a positive correlation between sales space and sales volume, but, a common representation does not seem to be apparent from all these works, However, the multiplicity of retained functional forms shows that the partial observation of a space / sales function looks like an S-curve. Indeed, the relationship between space and sales volume can only be interpreted within the limits of the observed values of the space allocated. The very low variance of space explains that only a part of the curve can be studied empirically. Then only a phase of decreasing performance or a locally linear function can be observed. (Renaudin 2004), we can confirm that it's rather a different angle of view than a discrepancy on the space / sales correlation.

4. Interaction effects between shelves

The question of modeling the interactions between demand functions (between the functions linking the sales volume to the allocated space) arises mainly in the context of the normative literature on the allocation of space.
In fact, sales volume of a product or a category depends on the space allocated to it, but also on the space allocated to other products or categories. These interactions can be illustrated through the concept of elasticity, inspired from economy. (Renaudin, 2004)
Normative space allocation models use sales space elasticities that reflect the sensitivity of sales volumes to the allocated space (leverage effect).
There are three types of elasticities:

- **Direct elasticity** of sales volumes to sales space, which enable us to measure the possible variation of a product or category sales volume further to a 1% variance in allocated sales space.
- **Cross-elasticities,** which measure the marginal variance of a product or category sales attributable to a 1% increase in allocated space of another product or category. A negative elasticity expresses a substitution ratio and a positive elasticity a ratio of complementarity. Sales space Cross-elasticities, introduced for the first time in the Corstjens and Doyle (1981) were repeated in most normative subsequent models (Borin et al., 1994; Urban, 1998 ; Bultez et al., 1988, 1989, 1995 ; Campo et al., 2000, Renaudin, 2004)
- **"Hierarchical" elasticities** that measure the variance ratio of a product group which result of an increase of 1% of allocated sales space of the product or category that is one level below it in the bill of material. It's for example, the elasticity of the store sales to the space allocated to a department, or the sales elasticity of a family of products to the space allocated to a reference. However, they were introduced in a simplified form in Campo and al. (2000) and used in models of aid to decision proposed by some research companies. (Renaudin (2004)

5. Conclusion

This article has allowed us to confirm the correlation between sales space and sales volume, to define and list its different types of function, as well as the interaction effects between shelves and elasticities that measure the different levels of sensitivities. This research has some limitations, due to the lack of an empirical component, indeed, we'll continue our research by developping a conceptual framework to analyze this correlation at the shelf level, and to complete it with an empirical study of a real case of fast moving consumer goods.

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